



# First records of two lobate comb-jellies (Ctenophora) from the Pakistani coast

Shahnawaz Gul<sup>1\*</sup> and Otto M. P. Oliveira<sup>2</sup>

<sup>1</sup> Department of Zoology, Jamia Millia Government Degree College, Malir, Karachi, Pakistan

<sup>2</sup> Centro de Ciências Naturais e Humanas, Universidade Federal do ABC, São Bernardo do Campo, SP, Brazil

\* Corresponding author. E-mail: [gulshahnawaz@yahoo.com](mailto:gulshahnawaz@yahoo.com)

**Abstract:** The knowledge on the comb-jellies faunistics along the southern Asian coast is very scarce. For some countries such as Pakistan there are no previous formal records of ctenophores. This study is a first survey to the group diversity along Pakistani coast, resulting in the first records of two lobate species, *Bolinopsis infundibulum* and *Ocyropsis maculata*.

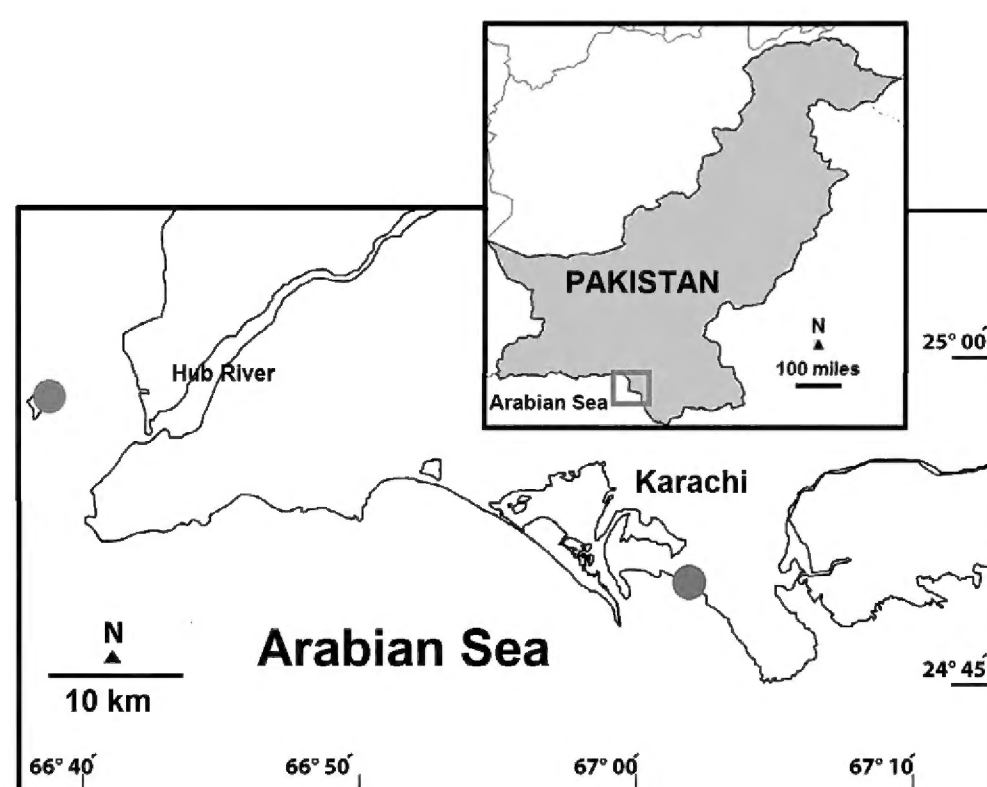
**Key words:** ctenophore, gelatinous predators, Indian Ocean, Arabian Sea.

Ctenophores or comb-jellies are a small group of about 100–150 species (Mills 1998–2014; Mianzan 1999) of marine gelatinous predators and the largest invertebrates which present ciliated locomotion. Most of the biogeographical records of ctenophores are limited to Atlantic and Pacific waters (e.g., Moser 1910; Mayer 1912; Mianzan 1999; Mills and Haddock 2007; Oliveira et al. in press) with large gaps along the Indian Ocean, including the coast of Pakistan. In part the paucity of records can be explained by the difficulty, or even the impossibility of preserving specimens of these fragile animals for zoological collections (see Adams et al. 1976; Oliveira et al. 2007), but another important factor is the scarcity of taxonomic specialists on the group worldwide and especially in this region. In this context, this study contributes new data on the ctenophore diversity in the Indian Ocean, and considerably extends the distribution of two species, *Bolinopsis infundibulum* (O.F. Müller, 1776) and *Ocyropsis maculata* (Rang, 1828).

One specimen of *Bolinopsis infundibulum* was photographed during scuba diving activities on 16 October 2011 at Charna Island (24°53'56.422" N, 66°36'15.297" E) (Figure 1). One *Ocyropsis maculata* specimen was also photographed, on 12 January 2014, at the same site. In addition, during monthly shore visits to Clifton (24°48'34.739" N, 67°00'41.255" E) (Figure 1) at Karachi, nine stranded specimens of *O. maculata* were collected

on 18 February 2014 (early summer) and preserved. Most of them were observed swimming among the tides by expanding their oral lobes like flaps. The vouchers (JMGDC MDZ CT 1P, 2P, 3) are deposited at the Museum of Department of Zoology, Jamia Milla Government Degree College, Malir, Karachi, Pakistan.

The photographed specimen of *B. infundibulum* (Figure 2) presents the characteristic dark pigment lines along the canals inside the lobes (Mills and Haddock 2007: 194). Although the validity of the nine species of *Bolinopsis* presented by Mills (1998–2014) is possibly an equivoque, needing a good systematic revision, none of the other species are described as presenting such pigment lines, except for *B. ashleyi* Gershwin, Zeidler & Davie, 2010. However, the Pakistani specimen do not present the characteristic hemispheric lobes nor the reddish coloration along the meridional canals observed in *B. ashleyi* (see Gershwin et al. 2010). The previous records of *B. infundibulum* are from the northern Atlantic and northern Pacific, always in temperate and subpolar latitudes. Our record for the Pakistani coast is the first



**Figure 1.** Map showing ctenophore occurrence points: Clifton (blue dot) and Charna Island (red dot) at Pakistani coast.



**Figure 2.** *Bolinopsis infundibulum* (O.F. Müller, 1776). Specimen from Charna Island, Pakistan. Legend: ao, apical organ; au, auricle; dpl, dark pigment lines along the canals inside the lobes; sscr, substomodaeal ctene row (Photo by Divers Reef Karachi).

for the Indian Ocean and for the subtropical zone.

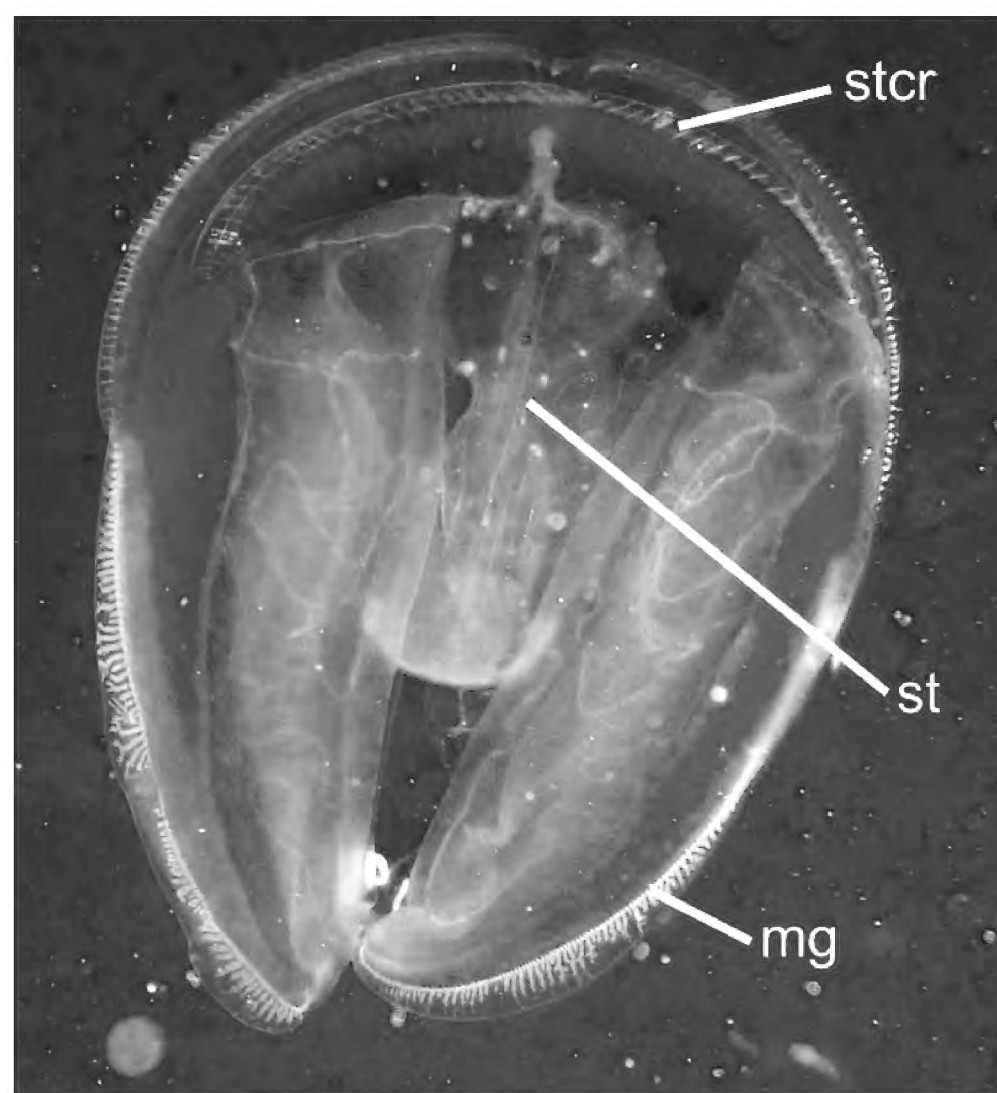
On the other hand, the specimens of *O. maculata* (Figure 3) presents tentacular sheaths, substomodaeal ctene rows extending aborally almost to the statocyst, and the stomodaeum deeply indented in an hourglass shape (Harbison and Miller 1986). Although the specimen photographed with the aid of scuba (Figure 3) presents a brownish pigmentation along the inner part of the lobes, it is quite different from the typical black spots generally attributed to *O. maculata maculata*, so it is closer to the *O. maculata immaculata* form (see Harbison and Miller 1986; Ruiz-Escobar et al. 2015). The stranded specimens did not present the brownish pigmentation, but shared all other characteristics with the specimen photographed in Figure 3. *Ocyropsis maculata* is believed to be a tropical and subtropical species, occurring in the Atlantic and Pacific oceans (Harbison et al. 1978; Wrobel and Mills 2003; Mills and Haddock 2007; Ruiz-Escobar et al. 2015; Oliveira et al. in press). This is the first record of the species from the Arabian Sea.

## ACKNOWLEDGEMENTS

We are very grateful to Farhan Herekar (Divers Reef Karachi), Mustafa Hasan (Indus Scuba) and their teams for the ctenophore images used. We are also thankful to the anonymous reviewers for corrections and comments on the manuscript.

## LITERATURE CITED

- Adams, H.R., A.P. Flerchinger and H.F. Steedman. 1976. Ctenophora fixation and preservation; pp. 270–271, in: H.F. Steedman (ed.). Zooplankton fixation and preservation. Paris: UNESCO Press.
- Gershwin, L., W. Zeidler and P.J.F. Davie. 2010. Ctenophora of Australia. Memoirs of the Queensland Museum, Nature 54(3): 1–45.
- Harbison G.R., L.P. Madin and N.R. Swanberg. 1978. On the natural history and distribution of oceanic ctenophores. Deep-Sea Research 25: 233–256.
- Harbison, G.R. and R.L. Miller. 1986. Not all ctenophores are



**Figure 3.** *Ocyropsis maculata* (Rang, 1828). Specimen from Charna Island, Pakistan. Legend: mg, male gonads along the oral half part of the substomodaeal meridional canal; st, stomodaeum presenting the characteristic compression in the middle part; stcr, subtentacular ctene row (Photo by Indus Scuba).

- hermaphrodites: studies on the systematic, distribution, sexuality and development of two species of *Ocyropsis*. Marine Biology 90: 413–424.
- Mayer, A.G. 1912. Ctenophores of the Atlantic coast of North America. Carnegie Institution of Washington, Publication 162: 58 pp.
- Mianzan, H. 1999. Ctenophora; pp. 561–573, in: D. Boltovskoy (ed.). South Atlantic Zooplankton. Leiden: Backhuys Publishers.
- Mills, C.E. 1998–2014. Phylum Ctenophora: list of all valid species names [last updated 16 March 2014]. Accessed at <http://faculty.washington.edu/cemills/Ctenolist.html>, 9 June 2015.
- Mills, C.E. and S.H.D. Haddock. 2007. Ctenophores; pp. 189–199, in: J.T. Carlton (ed.). Light and Smith's manual: intertidal invertebrates of the central California coast. 4<sup>th</sup> edition. Berkeley: University of California Press.
- Moser, F. 1910. Die Ctenophoren der Deutschen Südpolar-Expedition 1901–1903. Deutsche Südpolar-Expedition, 11, Zoologie: 117–192.
- Oliveira, O.M.P., H. Mianzan, A.E. Migotto and A.C. Marques. 2007. Chave de identiﬁ cação dos Ctenophora da costa brasileira. Biota Neotropica 7(3): 342–350. doi: 10.1590/S1676-06032007000300034
- Oliveira, O.M.P., E.M. Araújo, P. Ayón, C.M. Cedeño-Posso, A.A. Cepeda, P. Córdova, A.F. Cunha, G.N. Genzano, M.A. Haddad, H.W. Mianzan, A.E. Migotto, L.S. Miranda, T.P. Miranda, A.C. Morandini, R.M. Nagata, K.B. Nascimento, M. Nogueira-Jr, S. Palma, J. Quiñones, C.S. Rodriguez, F. Scarabino, A. Schiariti, S.N. Stampar, V.B. Tronolone and A.C. Marques. [In press]. Census of Cnidaria (Medusozoa) and Ctenophora from South American marine waters. Zootaxa.
- Rang, P.C.A.L. 1828. Établissement de la famille des Béroïdes dans l'ordre des acalèphes libres, et description de deux genres nouveaux qui lui appartiennent. Mémoires de la Société d'Histoire Naturelle de Paris 4: 166–173.

- Ruiz-Escobar, F., D.K. Valadez-Vargas and O.M.P. Oliveira. 2015. Ctenophores from the Oaxaca coast, including a checklist of species from the Pacific coast of Mexico. *Zootaxa* 3936(3): 435-445. doi: 10.11646/zootaxa.3936.3.9
- Wrobel, D. and C. Mills. 2003. Pacific coast pelagic invertebrates: a guide to the common gelatinous animals. Second printing with corrections. Monterey, California: Sea Challengers and the Monterey Bay Aquarium. 108 pp.

**Authors' contribution statement:** SG collected and examined specimens & images, and prepared the map. OMPO confirmed the taxonomic identifications. Both authors wrote the manuscript.

**Received:** 12 September 2014

**Accepted:** 30 May 2015

**Academic editor:** Sérgio N. Stampar